DOCUMENT RESUME

ED 271 217 PS 015 890

AUTHOR Hranitz, John R.
TITLE Montessori and Brain Research.
INSTITUTION Bloomsburg Univ., PA.
PUB DATE 85
NOTE 12p.; Paper presented at the Conference on Children (Spring, 1985).
AVAILABLE FROM Dr. John R. Hranitz, Department of Curriculum and Foundations, Bloomsburg University of Pennsylvania, Bloomsburg, PA 17815 (no charge for first copy).
PUB TYPE Viewpoints (120) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Brain Hemisphere Functions; *Classroom Environment; *Concept Formation; Early Childhood Education; Educational Research; *Educational Theories; *Learning Processes; *Learning Theories; *Neurological Organization; Perceptual Development
IDENTIFIERS *Montessori (Maria)

ABSTRACT

Researchers in medicine, education, and related fields continue to make new discoveries about how the brain functions or malfunctions. The implications of studies of how young children learn compare favorably with those of educators such as Maria Montessori, Jerome Bruner, and Jean Piaget. These researchers saw growth and development as a series of stages related to inherited potential, maturation, and experiences. Brain research has concluded that (1) no single area of the brain can function alone, (2) individuals generate and associate different meanings to similar experiences, (3) the brain grows in spurts, (4) the brain responds to the environment surrounding it, (5) the brain can easily establish elaborate abstract coding and decoding systems, and (6) the brain deals with the world systematically. The role of the Montessori teacher--making the children the center of learning, encouraging children to use the freedom provided for them, observing children in order to prepare the best possible environment, recognizing sensitive periods, and diverting unacceptable behavior into meaningful tasks--supports the implications of this research. (HOD)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED271217

MONTESSORI AND BRAIN RESEARCH*

John R. Hranitz, Ed.D.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

John R. Hranitz

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

*Paper presented at the Spring, 1985 Conference on Children sponsored by the National Center For Montessori Education.

PS 015890

"Montessori and Brain Research"

Introduction

The study of the brain and how it functions has been called man's "last frontier on earth". One of the leading proponents of brain research today is Dr. Richard Restak. His texts: The Brain: The Last Frontier (1979) and The Brain (1984), have been widely acclaimed for their thoroughness and depth.

Each day finds more researchers in medicine, education, and related fields making new discoveries about how the brain functions or malfunctions. Brain research has largely concerned itself during the last five or six years with how the brain can malfunction or cease to function. For example, many researchers have been studying the effects of strokes and seizures on the brain. This research has led to many significant conclusions concerning the relationship of the brain and the total functioning of the body. Other researchers have concentrated their efforts on brain tumors, diseases such as Huntingdon's Chorea, and head injuries. All these studies yielded large amounts of data related to how the brain processes information.

Brain research is fast becoming a science of how young children learn. The implications of these studies compare favorably with such educators as Maria Montessori, Jerome Bruner, and Jean Piaget. Their findings suggest that concrete objects and experiences still prevail as the primary mode of learning. Actually, the education for all people would be greatly improved if teachers paid more attention to an experiential approach to learning. However, one only has to observe in a few schools to

find that the children complain of boredom and a general dislike for anything related to the schooling process. Teachers, by and large, still view the brain as a muscle that is to be exercised through the use of questions and rote drill. More attention needs to be given to the brain as a functioning part of the total body. Again, less emphasis should be placed on the correct answer and more attention on why children make the errors that they do. Teachers need to develop an air of quietness that comes from minds that are working than from threats of the loss of recess. At this point in my presentation, I would like to take a brief look at the history of brain research.

History

The brain is defined as a three pound mass of neuronal cells encased in a rock-like shell. Man has for centuries tried to describe how the brain works. If we go back to the Industrial Era, the brain was compared to a great pump. Later, the great pump gave way to the great machine. With the development of the telegraph key, the brain was viewed as a series of telegraph keys sending messages to all parts of the body. Finally, with the inventions developed in the Twentieth Century came the descriptions of the great switchboard and computer. Most researchers agree that the brain can be best compared to a computer. Thus, the brain and the technology surrounding it have "come of age" (Rose, 1975).

Throughout history there have been several individuals that have been recognized for their pioneering efforts in brain research. For example, no course in General Psychology would be

complete without mentioning Franz Gall. He believed that all aspects of the brain were localized. These areas could be discovered because they appeared as lumps or bumps on one's skull. Each lump had a reason for its existence. Some of these lumps meant that you were agreeable or combative. If you were a fantastic lover, you had a much larger or prominent bump on your skull (Rose, 1975).

Other researchers included Pierre Forenz, Paul Broca, Carl Wernicke, and Ramon y Cajal (Ka-hall). Pierre Forenz's work, like that of Gall's, was highly speculative about the cerebellum and how it functions. Paul Broca's work led to the identification of an area in the left hemisphere responsible for language production. Carl Wernicke is given credit for locating the area in the left hemisphere that allows us to comprehend language. Both Broca and Wernicke are also given credit for developing the hemispheric functioning of the brain (Restak, 1984).

Ramon y Cajal and Camilla Golgi were two truly remarkable scientists. In 1906, they shared the Nobel Prize for their conceptions on how the brain was able to function. Golgi's view of a neuronal network gave way to Cajal's view of neurons lying in close proximity to each other but never touching (Rose, 1975). Still later was the view of the brain proposed by Donald Hebb, who supported the work of Cajal, but departed from it in that he explained the speed that ideas can be processed was due to clusters of cell assemblies. Perhaps this is why children lack the speed to process a great deal of information. Each concept

or idea must have its cell assembly if it is to be remembered. Again, the cell cluster view of the brain partially explains why we do not have to relearn or experience such words as rabbit, cat, or dandelions. The cell clusters contain all the information that we need and retrieval is instantaneous. It is like having all the ideas you want at your fingertips. However, everyone knows what happens if the information was not stored properly or was totally missing. Maybe we are only a few years away from telling the child that does not know an answer to one of our questions that he will need to spend some time and reprogram his cell assemblies. On a similar note, psychiatrists using Hebb's theory in dealing with mental illness would be able to realign or program certain cell assemblies and the patient would be normal (Restak, 1984). Before I close this section on the history of brain research, I would like to have you think of what it would be like to live one hundred years from now. Teaching, learning, and dealing with mental illness could be as easy as getting your oil changed in your car today.

Brain Models

There are three basic brain models:

(1) "Up-and-Down" or Evolutionary Model;

(2) "Side-by-Side" or Hemispheric Model; and

(3) "Connections" or Programs Model

Most of the research has centered upon hemispheric and connections (Languis, Sanders and Tipps, 1980).

Basically, the hemispheric model views the brain as being divided into two symmetrical halves; each half containing

distinct functions.

Left Hemisphere

1. Takes bits and pieces of information and lines them up to arrive at a convergent conclusion.
2. Sequences and is logical.
3. Controls sensory and motor functions for the right side of the body.
4. Language - symbols and sounds.
5. Encoding and decoding of symbols and sounds.
6. Mathematical functions.
7. Two dimensional experiences.
8. Learning to read using the phonic method - sound to symbol to word relationship is developed.
9. Writing ability - "inner language" to print.
10. Use of this hemisphere increases with development.
11. Thinks part to whole, inductive reasoning.

Right Hemisphere

1. Thinks whole-to-part: holistically deductive reasoning.
2. Starts with the answer, perceives the whole pattern and discovers a divergent conclusion.
3. Experiences difficulty with sequential thought.
4. Intuitive.
5. Controls sensory and motor function for the left side of the body.
6. Visuo-spatial.
7. Three dimensional experiences processed.
8. Views reality in its totality.
9. Learning to read is done by whole word process.
10. Recognizes faces and patterns.
11. Learning for young children is first processed through

this hemisphere (Languis, Sanders, and Tipps, 1980).

The connections model supports the idea that there are networks of cell assemblies. These cell assemblies allow us to retrieve concepts such as triangles, chairs, people, and places. Each concept or idea does not have to be relearned (Restak, 1984). The connections theory finds general agreement with the views of Montessori, Piaget, and Bruner. These researchers saw growth and development as a series of stages related to inherited potential, maturation, and experiences.

Research has concluded that:

1. No single area of the brain can function alone. All areas of the brain are in constant contact. The brain works as an integrated whole (Ornstein and Thompson, 1984).

2. Individuals generate and associate different meanings to similar experiences.

3. The brain grows in spurts. At birth, the brain weighs approximately 1 pound. The second pound is added by age two. The last pound occurs from two to sixteen years.

4. The brain responds to the environment surrounding it. In the early years, Maria Montessori referred to this as the "Unconscious Absorbent Mind". The child's brain responds to and is attracted to sights and sounds being recorded. The brain is drawn to stimuli much like two magnets.

5. The brain can easily establish elaborate abstract coding and decoding systems found in different spoken and written languages, and mathematics.

6. The brain deals with the world systematically. It actively seeks patterns and wants to make sense of the world. The brain is in a constant state of disequilibrium. It wants stimuli. It lives on stimuli (Languis, Sanders, and Tipps, 1980).

Montessori and Brain Research

Montessori

1. The child learns through his senses. Motor use is necessary for development of mental concepts/ideas. The areas of Sensory-Motor, Practical Life and Creative experiences demonstrate and appeal to the visuo-spatial half of the brain. Concrete materials and motor activity are two inherent practices. The child is free to use/reuse the materials available to him.

2. The prepared environment meets the needs of the child from birth to adulthood. Concepts are demonstrated by the teacher. Each child learns with the use of concrete materials. The use of the "three part lesson" again illustrates the development of meaning through imitation and modeling (Montessori, 1964).

3. The variety of materials and quality of the teacher's interaction between the child and the materials allow for each child's learning style. Individualization is easily achieved in a Montessori classroom.

4. The curriculum of the Montessori classroom allows for this variety. Again, the availability of creative materials encourages development not only in the areas of art and music but also mathematics, morality, logiospatial, physical, and social-emotional.

5. Montessori fosters language through the use of materials and the amount of interaction between teachers and children, and children and children. Writing down the children's dictated stories develops the link between spoken and written language. Multi-aged grouping fosters language development.

6. The prepared environment provides a carefully planned array of materials; each sequenced according to difficulty. The materials are arranged by the teacher from simple to complex.

7. Through the use of structured play, freedom within limits, and opportunities for repeated use of materials learning is fostered in the Montessori classroom.

8. In a Montessori classroom, the child is free to choose materials which meet his/her needs at the present time. Guidance and support are available from a supportive adult.

9. Montessori's prepared environment fosters the

normalization of the child through freedom within limits, free choice, and manipulation.

10. Prepared environment provides a variety of concrete materials for each child. The arrangement of materials fosters order when the child is ready for it (Montessori, 1914).

Brain Research

1. The child is a right-brain learner. The child visuo-spatially interacts with the world. The world is seen first as a whole. Only when parts of the whole are defined does the child see the parts. Adults need to demonstrate how things function.

2. Children need an environment in which they can explore, select, and manipulate materials. Modeling and imitation account for 75% of what the child learns. Language becomes an important tool for storing, manipulating and retrieving concepts.

3. Children respond to their environment in different ways. Each child possesses a learning style. The smaller the group, the more each child learns.

4. Gifted children need to be exposed to a wide array of materials and experiences. They also need the support of adults.

5. For language to develop, it needs stimulation and opportunities for expression both orally and in writing.

6. The brain needs an arrangement of materials that proceed from simple to complex. These should be available when needed.

7. New learnings are gradually, through repeated exposures, integrated into the structures within the brain.

8. The brain educates itself. It constantly seeks stimulation.

9. Anxiety, stress and other tension producing stimuli can reduce the amount of learning. Intrinsic motivation should provide the impetus for learning. The brain cannot help but learn.

10. Sensory motor development provides the foundation for later learnings. There are certain periods in which the child seems to learn certain ideas/concepts easily (Languis, Sanders, and Tipps, 1980).

Summary

Montessori was dedicated to the principles of: Respect for the Child, The Absorbent Mind, Sensitive Periods, The Prepared Environment, Self-or Auto Education. The role of the Montessori teacher: making the children the center of learning, encouraging children to use the freedom provided for them, observing children in order to prepare the best possible environment, recognizing sensitive periods, and diverting unacceptable behavior into meaningful tasks, supports the implications of brain research today (Montessori, 1914). In conclusion, Montessori explains how children learn best: active learning in a prepared environment (Montessori, 1964). This should be available to all children in all educational settings.

References

Blakemore, Colin. Mechanics of the Mind. New York: Cambridge University Press, 1977.

Gage, N. L. Hard Gains in the Soft Sciences: The Case of Pedagogy. Bloomington, Indiana: Phi Delta Kappa, 1985.

Granit, Ragnar. The Purposive Brain. Cambridge: The M.I.T. Press, 1977.

Harth, Erich. Windows on the Mind: Reflections on the Physical Basis of Consciousness. New York: William Morrow & Co., Inc. 1982.

Languis, Marlin, Tobie Sanders, and Steven Tipps. Brain and Learning: Directions in Early Childhood Education. Washington, D.C.: National Association for the Education of Young Children, 1980.

Luria, A.R. The Mind of A Mnemonist: A Little Book About a Vast Memory. Chicago: Henry Regenery Co., 1968.

Marks, Lawrence E. The Unity of the Senses: Interrelations Among the Modalities. New York: Academic Press, 1978.

Montessori, M. Dr. Montessori's Own Handbook, Schocken Books, 1914.

Montessori, M. The Montessori Method, New York: Schocken Books, 1964.

Ornstein, Robert, and Richard F. Thompson. The Amazing Brain. Boston: Houghton Mifflin Company, 1984.

Restak, Richard M. The Brain, New York: Bantam Books, Inc., 1984.

Restak, Richard M. The Brain: The Last Frontier. New York: Warner Books, Inc., 1979.

Rose, Steven. The Conscious Brain. New York: Alfred Knopf, 1973.

Taylor, Gordon Rattray. The Natural History of the Mind. New York: E.P. Dutton, 1979.

Thorndike, Robert L. Intelligence as Information Processing: The Mind and The Computer. Bloomington, Indiana: Phi Delta Kappa, 1984.

Yates, Francis A. The Art of Memory. Boston: Routledge and Kegan Paul. 1966.